Electronic supplementary information

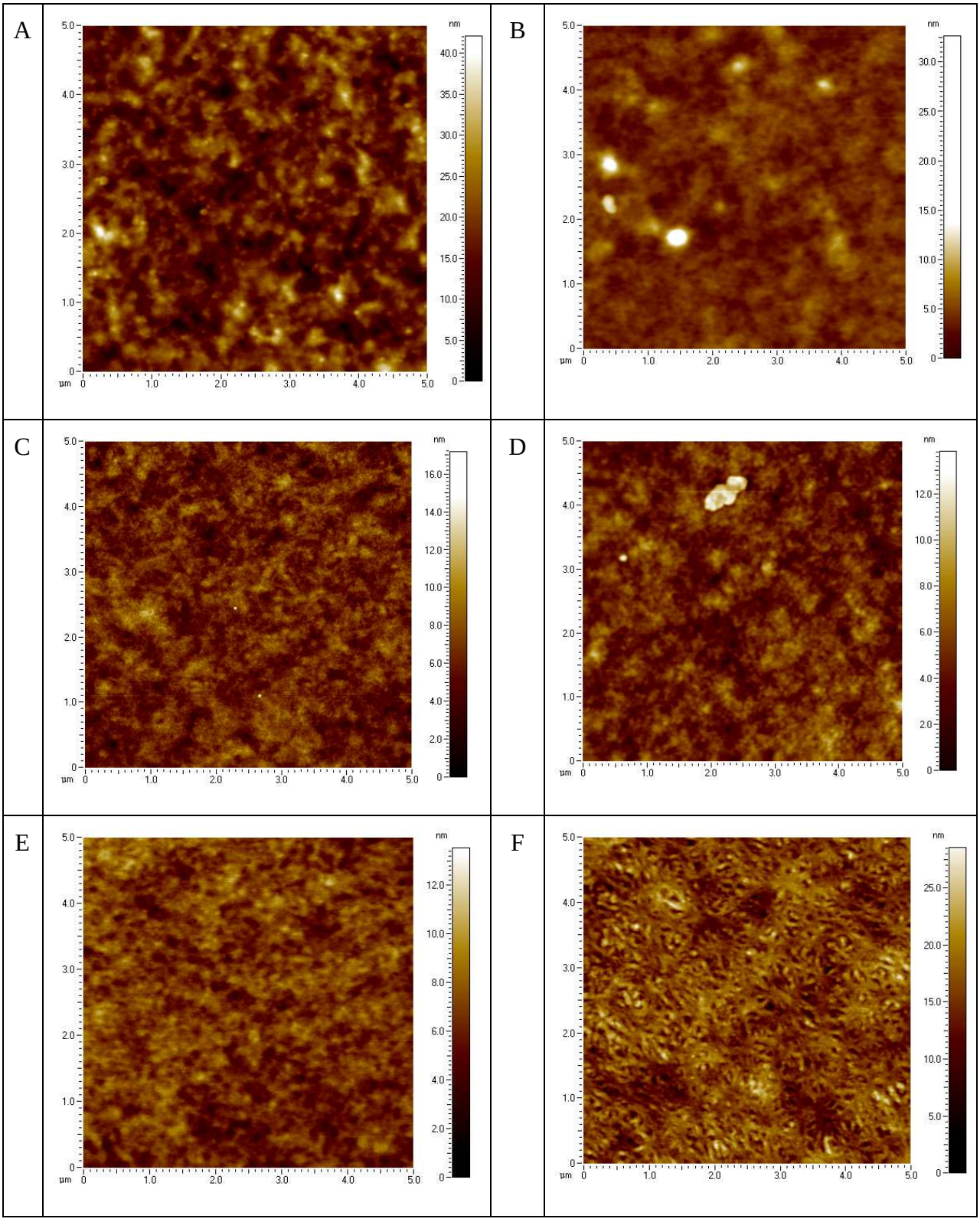

Figure S1. AFM height images of the composites of **F13** with P3BT(A), P3PT(B), P3HT (C), P3HepT (D), P3DT (E) and P3DDT (F).

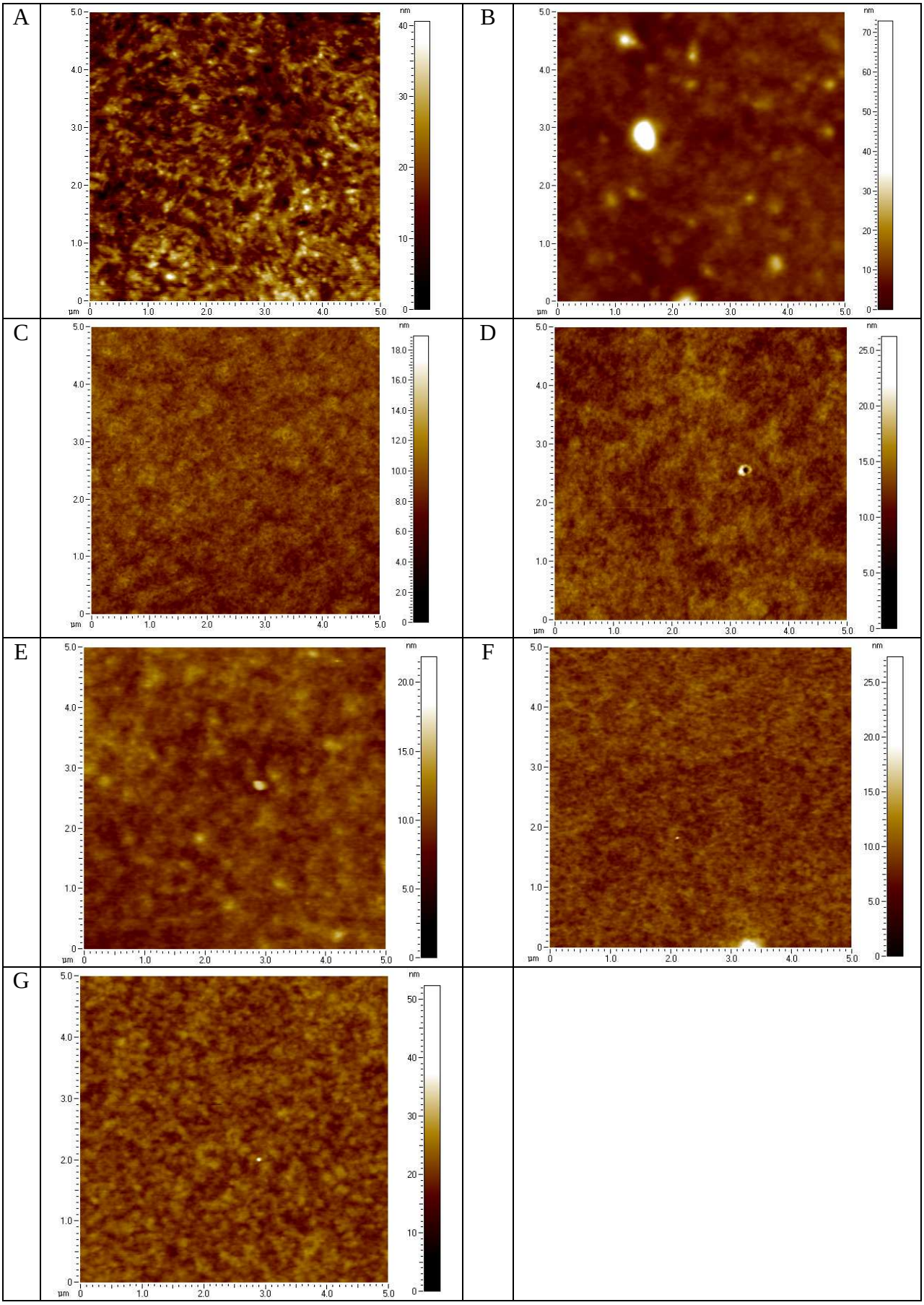

Figure S2 AFM height images of the composites of **F3** with P3BT(A), P3PT(B), P3HT (C), P3HepT (D), P3OT (E), P3DT (F) and P3DDT (G).

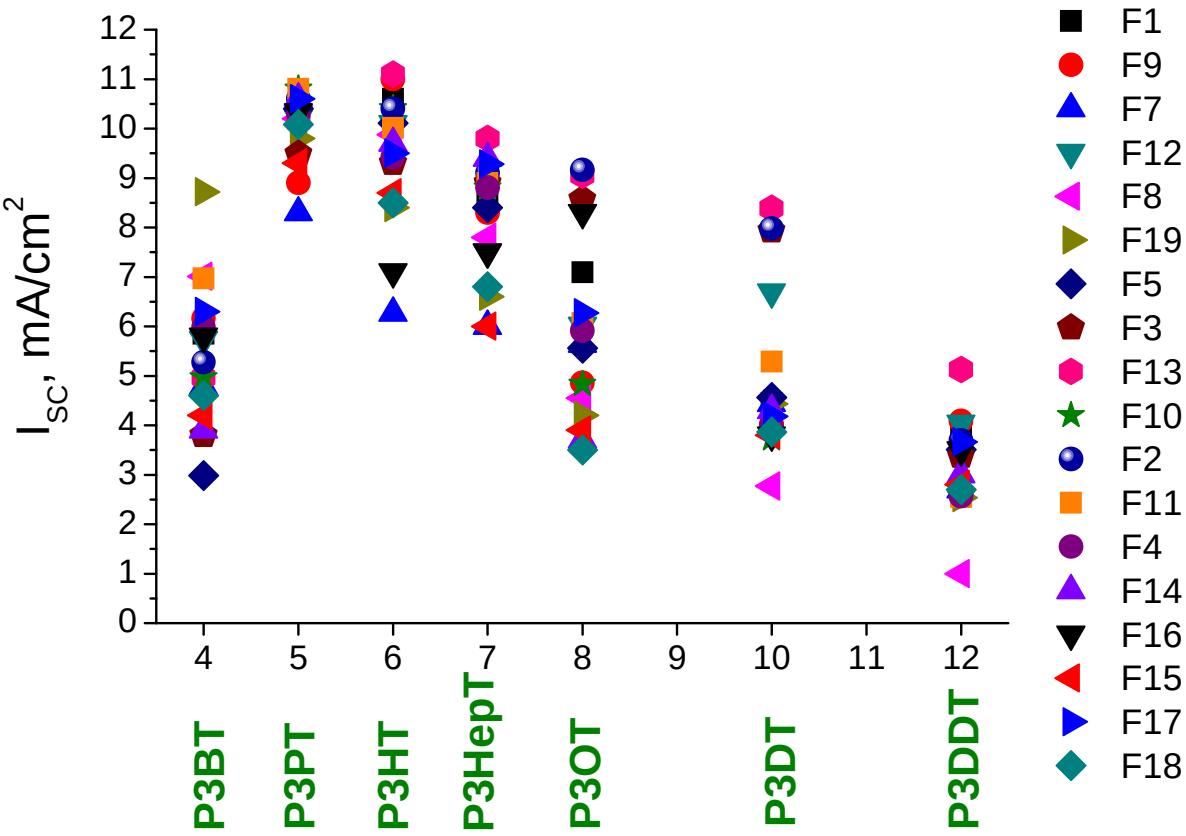

Figure S3. The dependence of the short circuit current on the length of the P3AT side chains in devices comprising fullerene derivatives **F1-F19**

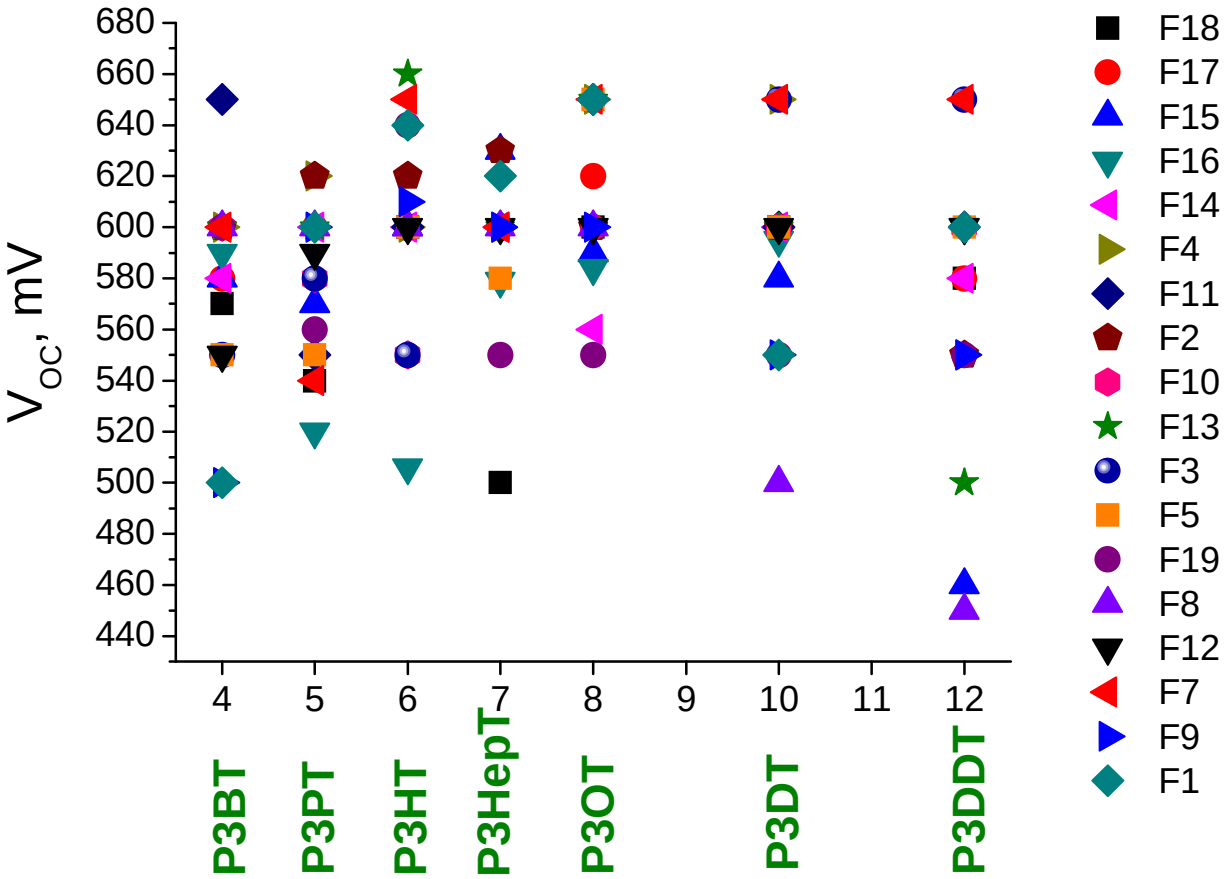

Figure S4. The dependence of the open circuit voltage on the length of the P3AT side chains in devices comprising fullerene derivatives **F1-F19**

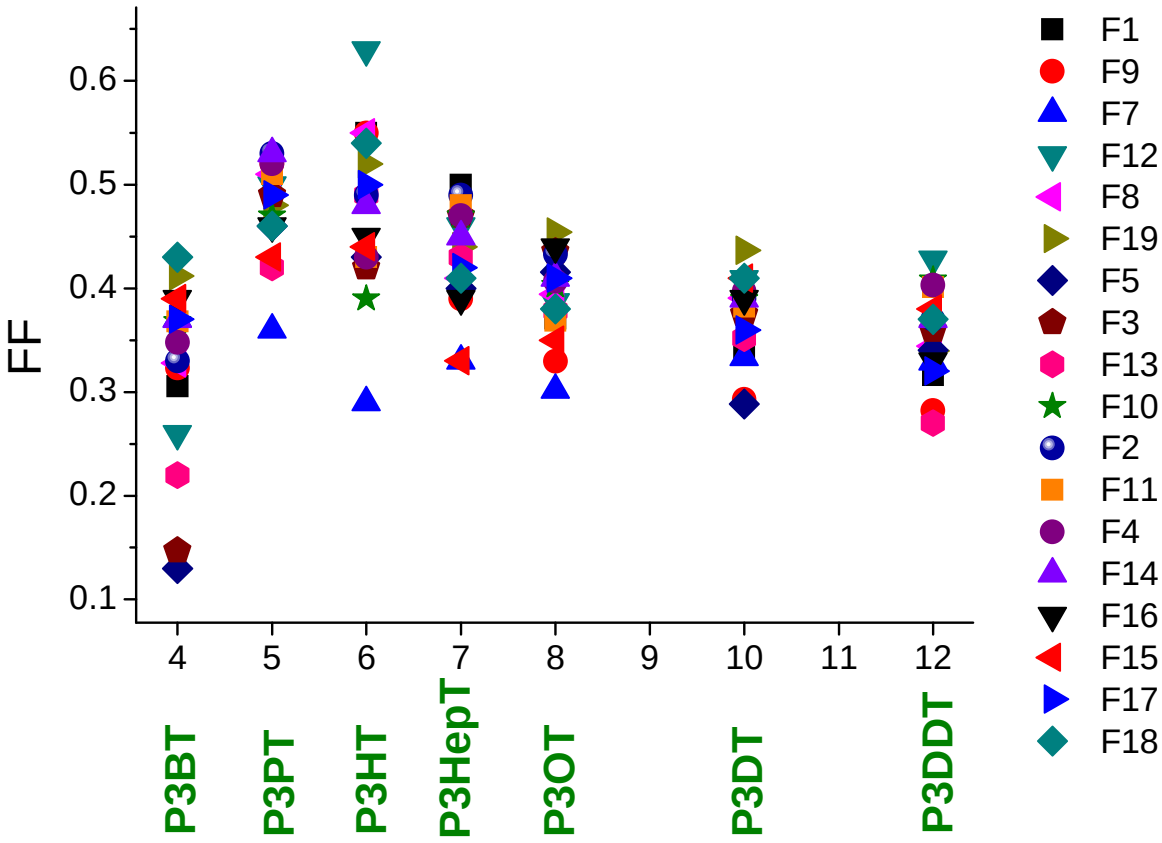

Figure S5. The dependence of the fill factor on the length of the P3AT side chains in devices comprising fullerene derivatives **F1-F19**

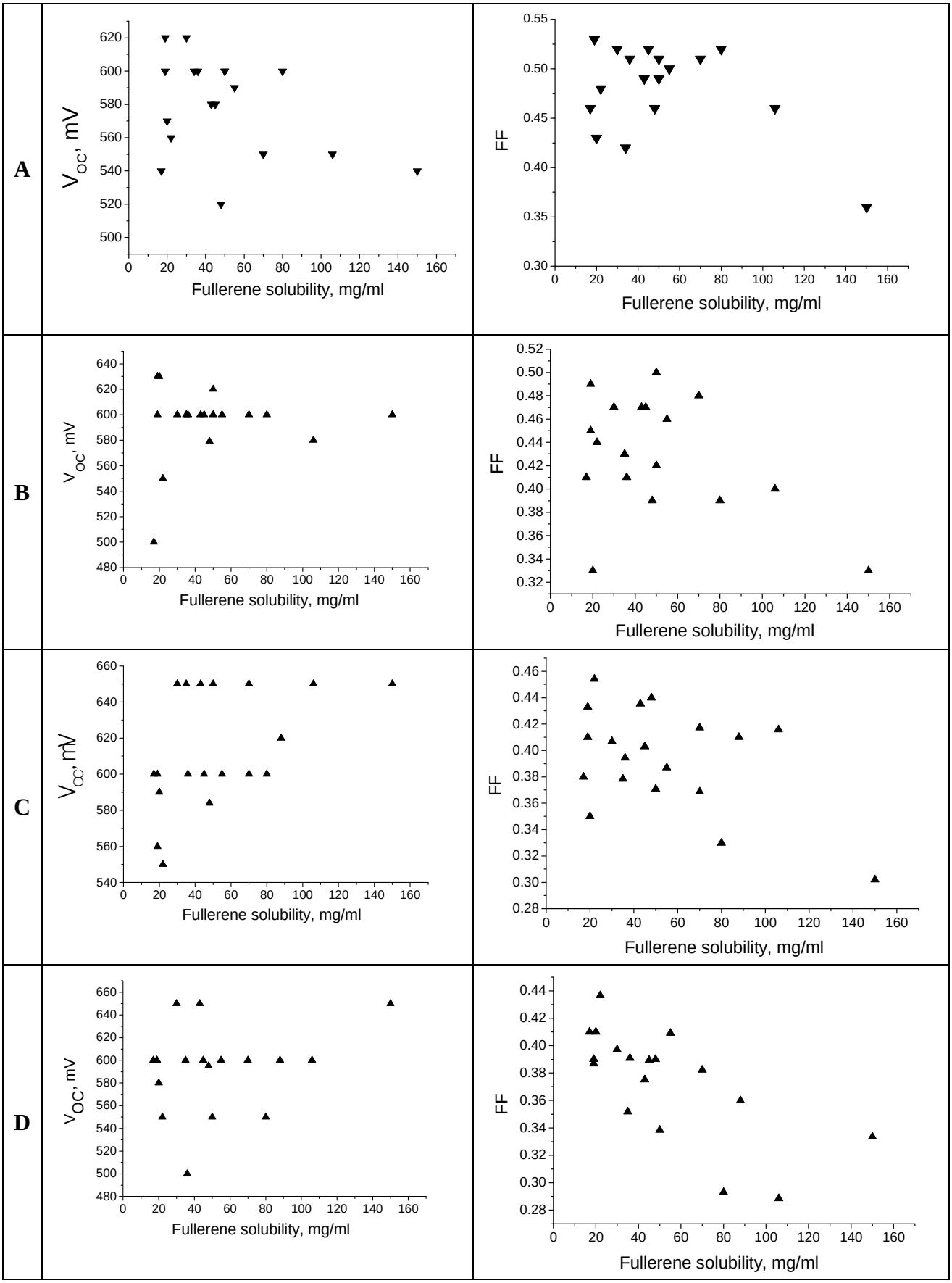

Figure S6. Open circuit voltage (left column) and fill factor (right column) of photovoltaic devices based on P3PT (A), P3HepT(B), P3OT(C) and P3DT (D) plotted as functions of the solubility of the fullerene component. No clear correlations are observed for V_{OC} and FF in cotrast to the I_{SC} and η (graphs shown in Figure 5 in the main text).

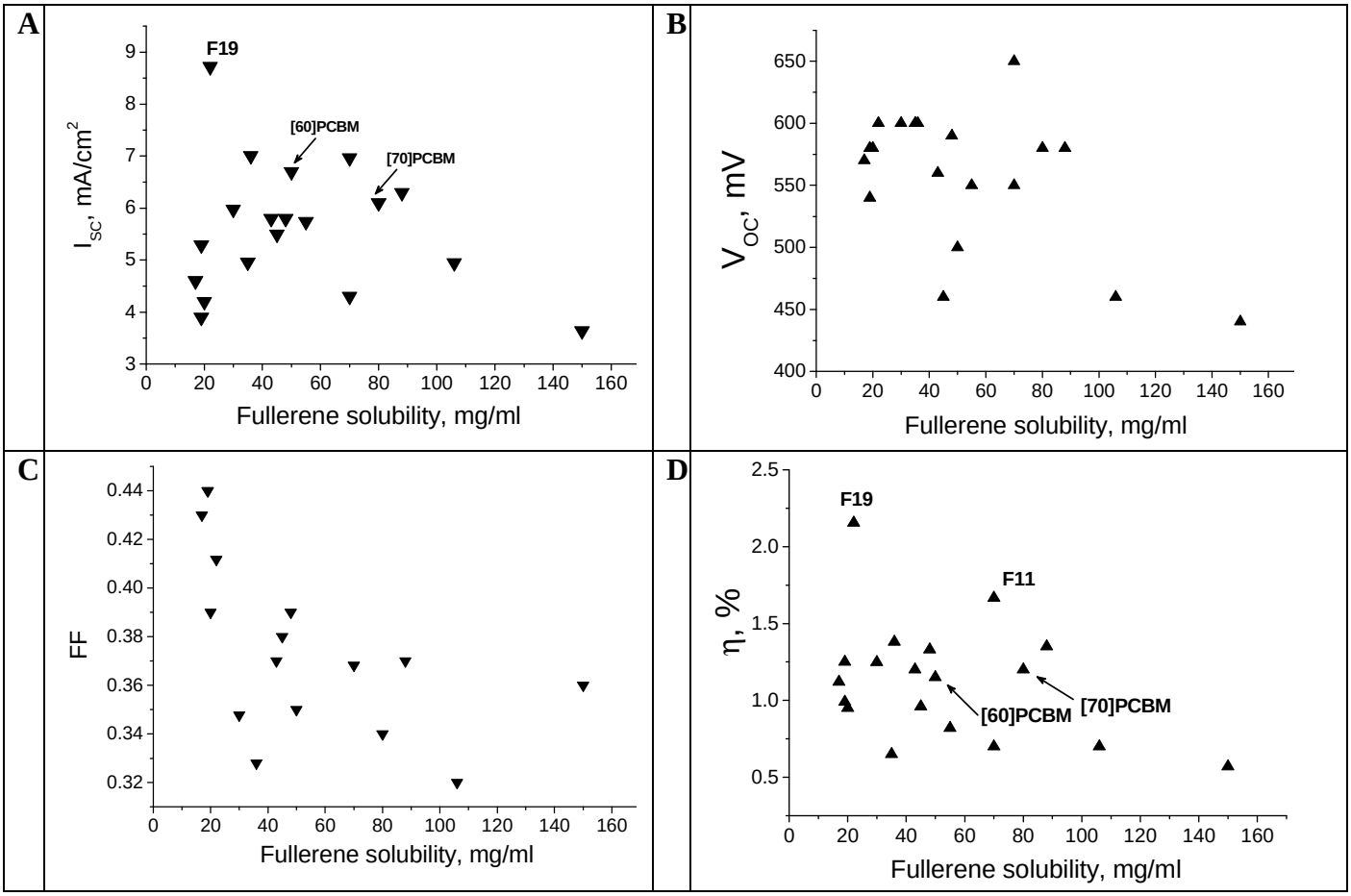

Figure S7. Short circuit current (A), open circuit voltage (B), fill factor (C) and light power conversion efficiency (D) of photovoltaic devices based on P3BT plotted as functions of the solubility of the fullerene component.

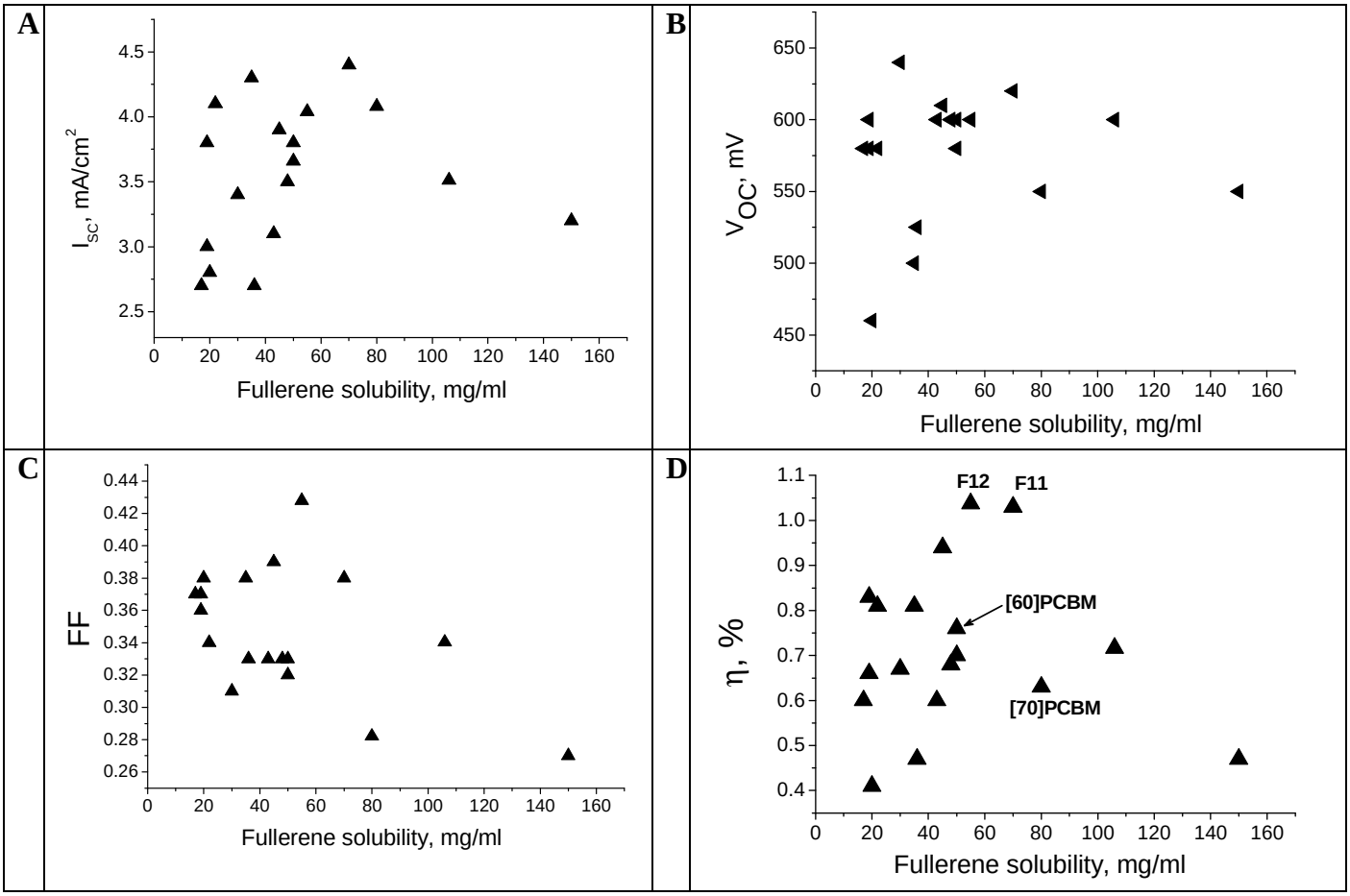

Figure S8. Short circuit current (A), open circuit voltage (B), fill factor (C) and light power conversion efficiency (D) of photovoltaic devices based on P3DDT plotted as functions of the solubility of the fullerene component.

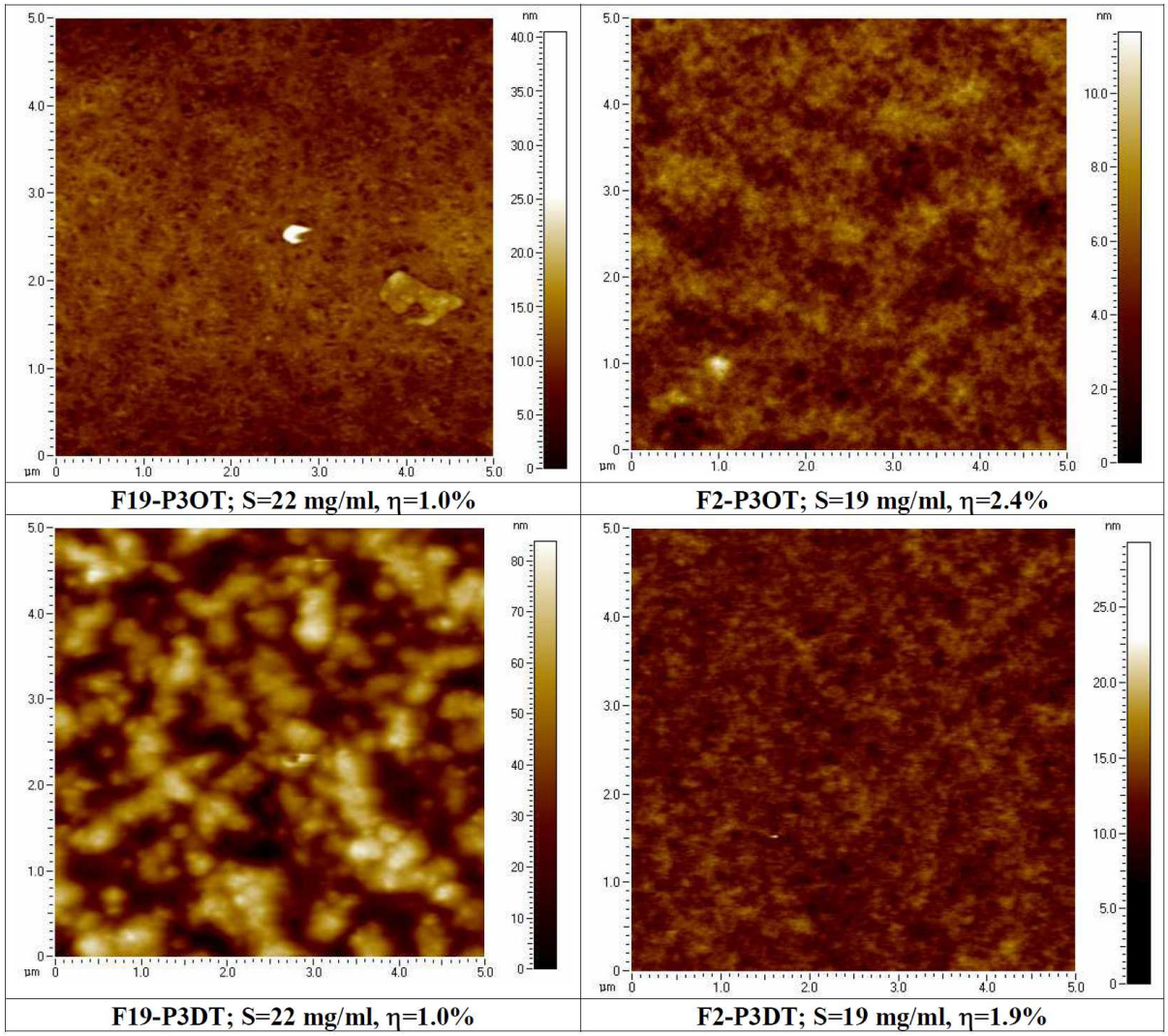

Figure S9. AFM images of the blends of P3OT and P3DT with the fullerene derivatives **F2** and **F19** possessing similar solubility (19 and 22 mg/ml, respectively) in chlorobenzene. Compound **F2** gives smoother and presumably more homogeneous blends with P3OT and P3DT which results in their superior photovoltaic performance.

Table S1 Parameters of photovoltaic devices based on P3BT and different fullerene derivatives

Fullerene derivative	S, mg/ml	I_{SC}, mA/cm^2	V_{OC}, mV	FF	η, %
F1	50	6.7	500	0.35	1.2
F2	19	5.3	540	0.44	1.3
F3	43	5.8	560	0.37	1.2
F4	30	6.0	600	0.35	1.2
F5	106	5.0	460	0.32	0.7
F6	70	4.3	550	0.29	0.7
F7	150	3.6	440	0.36	0.6
F8	36	7.0	600	0.33	1.4
F9	80	6.1	580	0.34	1.2
F10	45	5.5	460	0.38	1.0
F11	70	7.0	650	0.37	1.7
F12	55	5.7	550	0.26	0.8
F13	35	5.0	600	0.22	0.7
F14	19	3.9	580	0.44	1.0
F15	20	4.2	580	0.39	1.0
F16	48	5.8	590	0.39	1.3
F17	88	6.3	580	0.37	1.4
F18	17	4.6	570	0.43	1.1
F19	22	8.7	600	0.41	2.2

Table S2 Parameters of photovoltaic devices based on P3PT and different fullerene derivatives

Fullerene derivative	S, mg/ml	I_{SC}, mA/cm^2	V_{OC}, mV	FF	η, %
F1	50	10.2	600	0.51	3.1
F2	19	10.6	620	0.53	3.5
F3	43	9.5	580	0.49	2.7
F4	30	10.3	620	0.52	3.3
F5	106	10.4	550	0.46	2.6
F6	--	--	--	--	--
F7	150	8.3	540	0.36	1.6
F8	36	10.2	600	0.51	3.1
F9	80	8.9	600	0.52	2.8
F10	45	10.8	580	0.52	3.2
F11	70	10.8	540	0.50	2.9
F12	55	10.2	590	0.50	3.0
F13	34	10.2	600	0.42	2.6
F14	19	10.6	600	0.53	3.4
F15	20	9.3	570	0.43	2.3
F16	48	10.3	520	0.46	2.5
F17	50	10.6	610	0.49	3.2
F18	17	10.1	540	0.46	2.5
F19	22	9.8	565	0.48	2.7

Note: see *Adv. Funct. Mater.* **2009**, *19*, 779 for parameters of photovoltaic devices based on P3HT.

Table S3 Parameters of photovoltaic devices based on P3HepT and different fullerene derivatives

Fullerene derivative	S, mg/ml	I_{SC}, mA/cm^2	V_{OC}, mV	FF	η, %
F1	50	8.6	620	0.50	2.7
F2	19	9.1	630	0.49	2.8
F3	43	8.9	600	0.47	2.5
F4	30	8.8	600	0.47	2.5
F5	106	8.4	580	0.40	2.0
F6	--	--	--	--	--
F7	150	6.0	600	0.33	1.2
F8	36	7.8	600	0.41	1.9
F9	80	8.3	600	0.39	1.9
F10	45	8.8	600	0.47	2.5
F11	70	8.9	600	0.48	2.6
F12	55	7.5	600	0.46	2.1
F13	35	9.8	600	0.43	2.5
F14	19	9.4	600	0.45	2.5
F15	20	6.0	630	0.34	1.3
F16	48	7.5	579	0.39	1.7
F17	50	9.3	600	0.42	2.3
F18	17	6.8	500	0.41	1.4
F19	22	6.6	550	0.44	1.6

Table S4 Parameters of photovoltaic devices based on P3OT and different fullerene derivatives

Fullerene derivative	S, mg/ml	I_{SC}, mA/cm^2	V_{OC}, mV	FF	η, %
F1	50	7.1	650	0.37	1.7
F2	19	9.2	600	0.43	2.4
F3	43	8.6	650	0.44	2.4
F4	30	5.9	650	0.41	1.6
F5	106	5.6	650	0.42	1.5
F6	70	7.7	600	0.42	1.9
F7	150	5.6	650	0.30	1.1
F8	36	4.6	600	0.39	1.1
F9	80	4.9	600	0.33	1.0
F10	45	4.8	600	0.40	1.2
F11	70	6.1	650	0.37	1.5
F12	55	6.0	600	0.39	1.4
F13	35	9.1	650	0.38	2.2
F14	19	3.7	560	0.41	0.9
F15	20	3.9	590	0.35	0.8
F16	48	8.3	584	0.44	2.1
F17	88	6.3	620	0.41	1.6
F18	17	3.5	600	0.38	0.8
F19	22	4.2	550	0.45	1.0

Table S5 Parameters of photovoltaic devices based on P3DT and different fullerene derivatives

Fullerene derivative	S, mg/ml	I_{SC}, mA/cm^2	V_{OC}, mV	FF	η, %
F1	50	4.4	550	0.34	0.8
F2	19	8.0	600	0.39	1.9
F3	43	7.9	650	0.38	1.9
F4	30	4.0	650	0.40	1.0
F5	106	4.6	600	0.29	0.8
F6	70	3.6	600	0.32	0.7
F7	150	4.4	650	0.33	1.0
F8	36	2.8	500	0.39	0.5
F9	80	4.0	550	0.29	0.6
F10	45	3.7	600	0.39	0.9
F11	70	5.3	600	0.38	1.2
F12	55	6.7	600	0.41	1.6
F13	35	8.4	600	0.35	1.8
F14	19	4.3	600	0.39	1.0
F15	20	3.8	580	0.41	0.9
F16	48	3.8	595	0.39	0.9
F17	88	4.2	600	0.36	0.9
F18	17	3.9	600	0.41	1.0
F19	22	4.4	550	0.44	1.1

Table S6 Parameters of photovoltaic devices based on P3DDT and different fullerene derivatives

Fullerene derivative	S, mg/ml	I_{SC}, mA/cm^2	V_{OC}, mV	FF	η, %
F1	50	3.8	600	0.33	0.8
F2	19	3.8	600	0.36	0.8
F3	43	3.1	600	0.33	0.6
F4	30	3.4	640	0.31	0.7
F5	106	3.51	600	0.34	0.7
F6	70	--	--	--	--
F7	150	3.2	550	0.27	0.5
F8	36	2.7	525	0.33	0.5
F9	80	4.08	550	0.28	0.6
F10	45	3.9	610	0.39	0.9
F11	70	4.4	620	0.38	1.0
F12	55	4.04	600	0.43	1.0
F13	35	4.3	500	0.38	0.8
F14	19	3	580	0.37	0.7
F15	20	2.8	460	0.38	0.4
F16	48	3.5	600	0.33	0.7
F17	50	3.66	580	0.32	0.7
F18	17	2.7	580	0.37	0.6
F19	22	4.1	580	0.34	0.8

Table S7. Parameters of photovoltaic devices based on copolymer **CP-I** and different fullerene derivatives

Fullerene derivative	S, mg/ml	I_{SC}, mA/cm^2	V_{OC}, mV	FF	η, %
F1	50	8.8	950	0.41	3.5
F2	19	8.7	950	0.44	3.7
F3	43	7.9	800	0.38	2.4
F4	30	7.9	900	0.41	2.9
F5	106	5.9	900	0.25	1.3
F6	70	5.2	800	0.36	1.5
F7	150	4.1	950	0.29	1.1
F8	36	9.0	900	0.36	2.9
F9	80	5.6	800	0.37	1.7
F10	45	7.1	850	0.38	2.3
F11	70	7.6	950	0.37	2.7
F12	55	5.6	850	0.36	1.7

Table S8. Parameters of photovoltaic devices based on copolymer **CP-II** and different fullerene derivatives

Fullerene derivative	S, mg/ml	I_{SC}, mA/cm^2	V_{OC}, mV	FF	η, %
F1	50	10.2	500	0.40	2.04
F2	19	6.6	500	0.42	1.38
F3	43	5.0	500	0.37	0.93
F4	30	4.9	500	0.33	0.81
F5	106	5.8	500	0.33	0.96
F6	70	4.6	450	0.33	0.68
F7	150	2.4	450	0.27	0.29
F8	36	5.7	500	0.41	1.17
F9	80	10.2	500	0.37	1.89
F10	45	4.0	500	0.32	0.65
F11	70	4.6	450	0.35	0.72
F12	55	3.9	500	0.42	0.82
F13	35	10.7	550	0.36	2.12